

CLAIMS

We claim:

1. A method of identification and quantification of carboxylic acid(s) in a sample comprising the steps of:
 - a) combining a known amount of a carboxylic acid ester internal standard with said sample comprising said carboxylic acid ;
 - b) contacting said sample with either a chloroformate and an alcohol or a base and an alkyl halide to convert said carboxylic acid in said sample into a carboxylic acid ester of identical structure as that of said carboxylic acid ester internal standard except for the stable isotope atoms;
 - c) extracting said sample to isolate said carboxylic acid ester and said carboxylic acid ester internal standard; and
 - d) analyzing said carboxylic acid ester and said carboxylic acid ester internal standard by mass spectrometry.
2. The method of claim 1 wherein said mass spectrometric method is the isotope dilution mass spectrometric method using isotope labeled internal standard.
3. The method of claim 1 wherein said carboxylic acid is a carboxylic acid having the following formula $R_1\text{COOH}$ wherein R_1 is alkyl or aryl or heteroatom containing cyclic or non-cyclic group.
4. The method of claim 1 wherein said carboxylic acid ester internal standard is a stable isotope labeled internal standard.

5. The method of claim 1 wherein said carboxylic acid ester internal standard is synthesized by reacting an authentic sample of said carboxylic acid with a stable isotope labeled reagent to form said carboxylic acid ester internal standard having the following formula R_1OCOR_2 wherein R_2 is a stable isotope labeled alkyl group.
6. The method of claim 5 wherein said stable isotope labeled alkyl group R_2 is CD_3 wherein said carboxylic acid is reacted with a chloroformate and a labeled methanol, or with a base and a labeled methyl iodide.
7. The method of claim 5 wherein said stable isotope labeled alkyl group R_2 is CD_2CD_3 wherein said carboxylic acid is reacted with a chloroformate and a labeled ethanol, or with a base and a labeled ethyl iodide.
8. The method of claim 5 wherein said stable isotope labeled alkyl group R_2 is $CD_2C_6D_5$ wherein said carboxylic acid is reacted with a base and a labeled benzyl chloride.
9. The method of claim 1 wherein said extraction step c) can be any appropriate separating methods such as solid phase extraction, liquid-liquid extraction or solid supported liquid-liquid extraction.
10. The method of claim 1 wherein said alcohol is selected from a group consisting of methanol and ethanol.
11. The method of claim 1 wherein said chloroformate is selected from a group consisting of isobutyl chloroformate, methyl chloroformate, and ethyl chloroformate.
12. The method of claim 1 wherein said alkyl halide is selected from a group consisting of methyl iodide, ethyl iodide, and benzyl chloride.
13. The method of claim 1 wherein said base is selected from a group consisting of sodium hydroxide, sodium carbonate, pyridine and triethylamine.

14. The method of claim 1 wherein said sample contains either a singularity or a plurality of said carboxylic acids.
15. The method of claim 1 wherein said multiple carboxylic acids can be converted to said multiple carboxylic acid esters using either a chloroformate and a single alcohol or a base and a single alkyl halide.
16. The method of claim 1 wherein said multiple carboxylic acid ester internal standards can be synthesized using either a chloroformate and a single labeled alcohol or a base and a single labeled alkyl halide.
17. The method of claim 1 wherein there is no conversion of said stable isotope labeled carboxylic acid ester internal standard to its corresponding non-labeled carboxylic acid ester compound during step b).
18. The method of claim 1 wherein said converting step b) is performed in an aqueous environment.
19. The method of claim 1 wherein said converting step b) is performed before said extraction step.
20. The method of claim 1 wherein said converting step b) is quantitative.